Space Weather Technical Forecast

Issued on Monday, 01 August 2022 at 12:20 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of Active (Kp4) geomagnetic activity. Active electron fluence likely by day 4.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low over the past 24 hours, with one long duration C9.2 flare from the eastern limb around 31/2310 UTC. There is currently one sunspot region on the visible disc. AR3068 with a slight increase in length in the past 24 hours but no notable increase in complexity. No Earth-directed CMEs were observed.

Solar Wind / Geomagnetic Activity: Solar winds, as measured by DSCOVR at L1, indicate the recent/ongoing arrival of a Coronal Hole High Speed Stream. Wind speeds have risen to between 450 and 550 km/s. Density started above average rising to 19 ppcc around 31/1945 UTC then fell back to average or below average. The total interplanetary magnetic field (IMF), Bt was moderate with a max peak of 15 nT at 31/2120 UTC, before returning to weak levels from 01/0001 UTC. The north-south component, Bz, fluctuated moderately at times, between +10/-8 nT, before returning to weak levels after 01/0001 UTC. The Phi angle was mostly negative (towards the Sun). Geomagnetic activity was mostly Unsettled to Active (Kp 3-4) before becoming mainly Quiet (Kp 1-2) after 01/0001 UTC.

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV), as measured by GOES-16 was at background levels. The high energy electron flux (greater than 2 MeV) varied between background and moderate levels, with a brief peak at high levels of 1370 pfu observed at 31/1540 UTC. Electron fluence showed a declining then steady trend, remaining well below the Active threshold (1e8 integrated flux), with an observed fluence value of 8.78e6 integrated pfu recorded at 01/0001 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Low solar activity is expected to continue, with a slight chance of M-class flares. Flare risks may increase due to active regions rotating onto the visible disk in coming days.

Solar Wind / Geomagnetic Activity: No Earth directed CMEs are currently expected. Solar winds are slightly-elevated due to the onset of the HSS from CH07/-, a northward extension of the southern polar crown. CH07/- is a long feature spanning nearly 50 degrees of longitude along the southern hemisphere, therefore solar winds are expected to remain elevated or slightly elevated until later on day 3 or day 4 (03 or 04 Aug), when wind speeds are expected to fall back to background levels.

Geomagnetic activity should remain mainly Quiet with a chance of Unsettled or Active intervals through the period.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is expected to remain at background levels. The high energy electron flux (greater than 2 MeV) is expected to remain mostly at background to moderate levels, but with a chance of rising to give high levels at the diurnal maxima, perhaps becoming prolonged high by day 4 (04 Aug). The corresponding 24 hour fluence is most likely to remain below the Active threshold (1e8 integrated pfu) but on a steadily increasing trend from day 2 (02 Aug).

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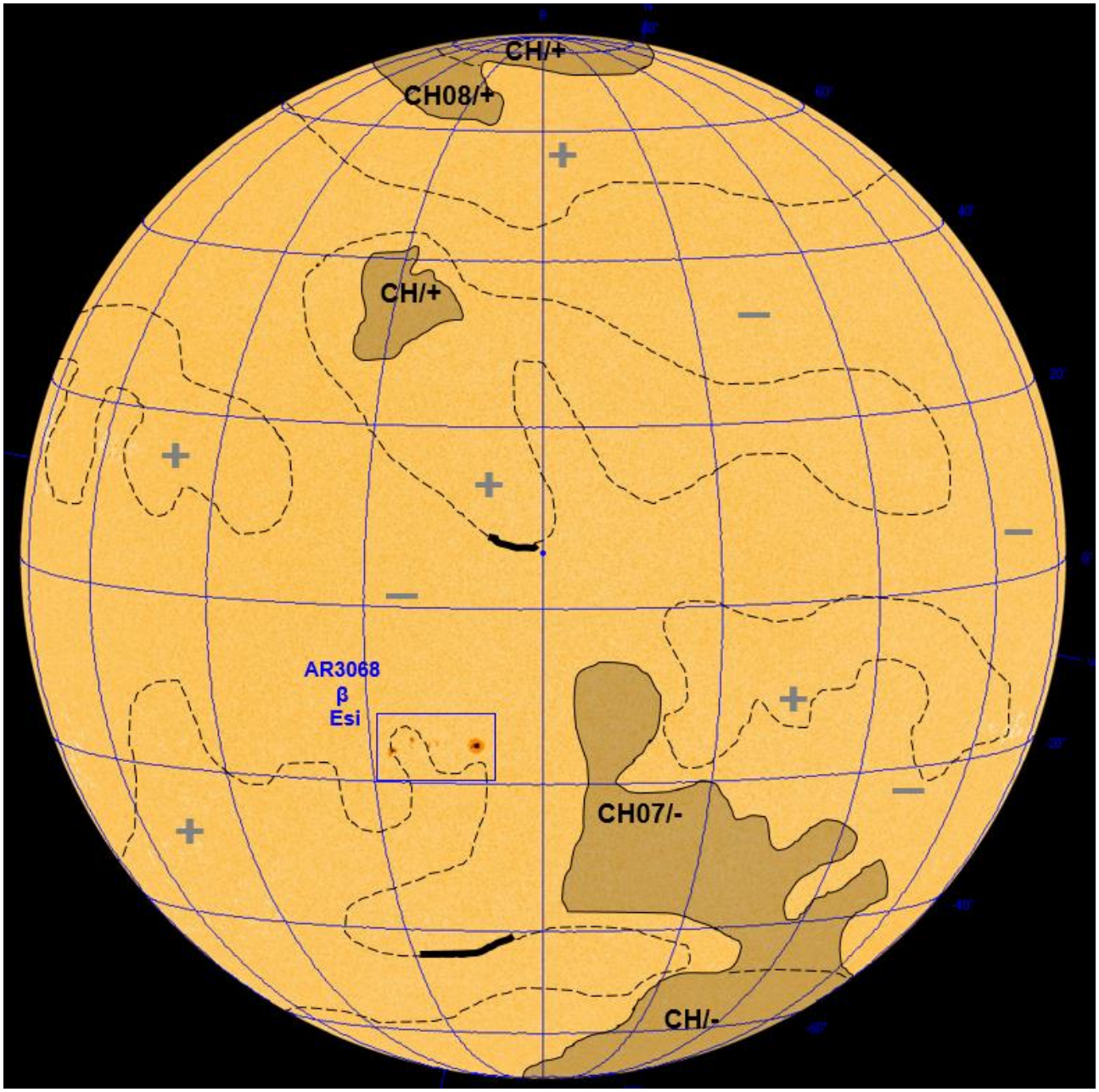
Figure 1. Solar Analysis Valid 01/0700 UTC.



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Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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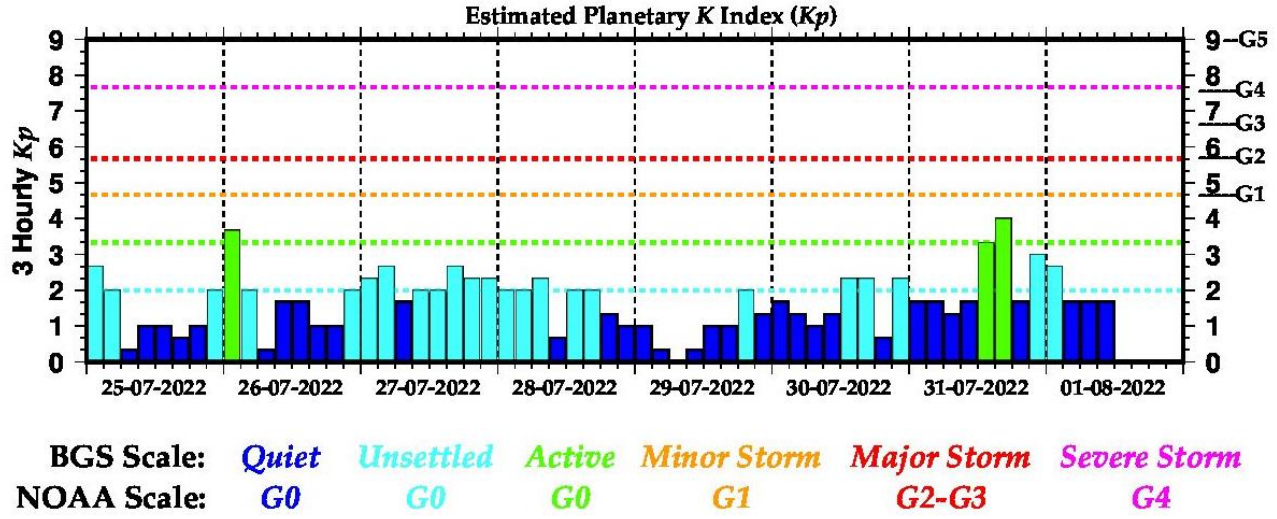
Geomagnetic Storms:

No Earth directed CMEs are currently expected. Earth now experiencing slightly-elevated solar winds, most likely due to the onset of the HSS from CH07/-. This is a large northward extension of the southern polar crown, spanning nearly 50 degrees of longitude along the southern hemisphere. Solar winds are expected to remain elevated or slightly elevated whilst in the HSS of CH07/-, which could be up to around 75-90 hours. This would take us to later on day 3 or more likely until day 4 (03 or 04 Aug), when wind speeds are expected to fall back to background levels.
Geomagnetic activity should remain mainly Quiet with a chance of Unsettled or Active intervals through the period.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	10	10	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections- Nil

Figure 2: BGS Estimated Kp index.



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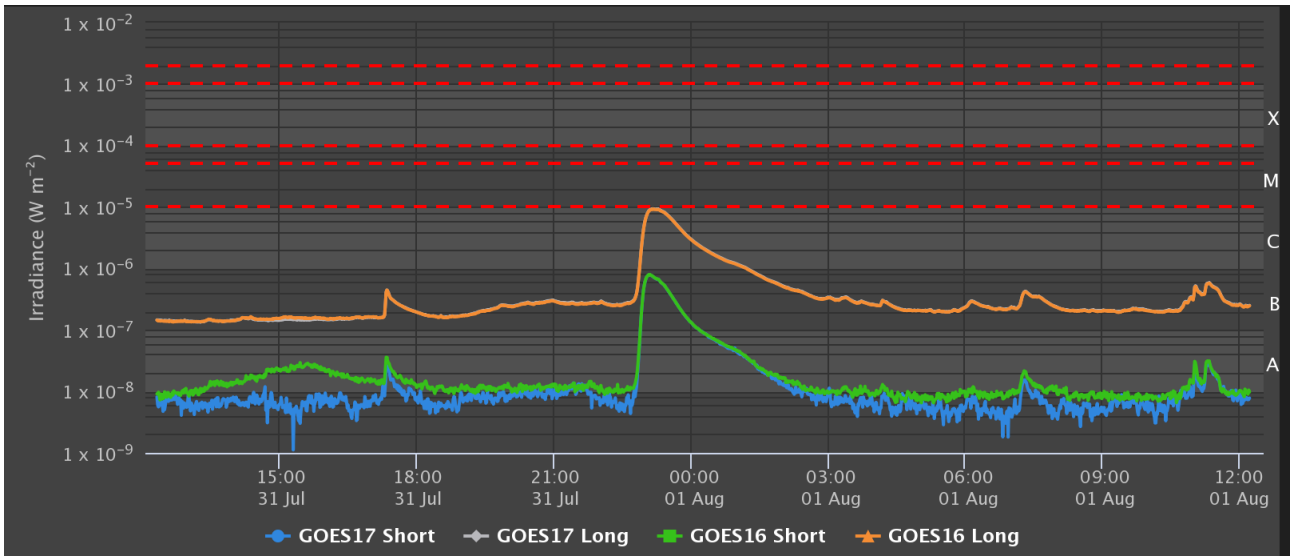
Radio Blackouts - X-Ray Flares:

Solar activity is currently low, with a long duration C9.2 flare around 31/2310 UTC. This originated from just around the northeast limb. There is one sunspot region on the visible disk, AR3068 (Esi/Beta) approaching the central meridian. STEREO imagery suggests the potential for further active regions to rotate onto the Earth-facing disc through the period. Activity is expected to remain Low, with a slight chance of rising to Moderate from any M-class flares.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	20	20	20	20
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: GOES16 X-Ray flares



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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is currently at Background levels and is expected to remain at this level through the period.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

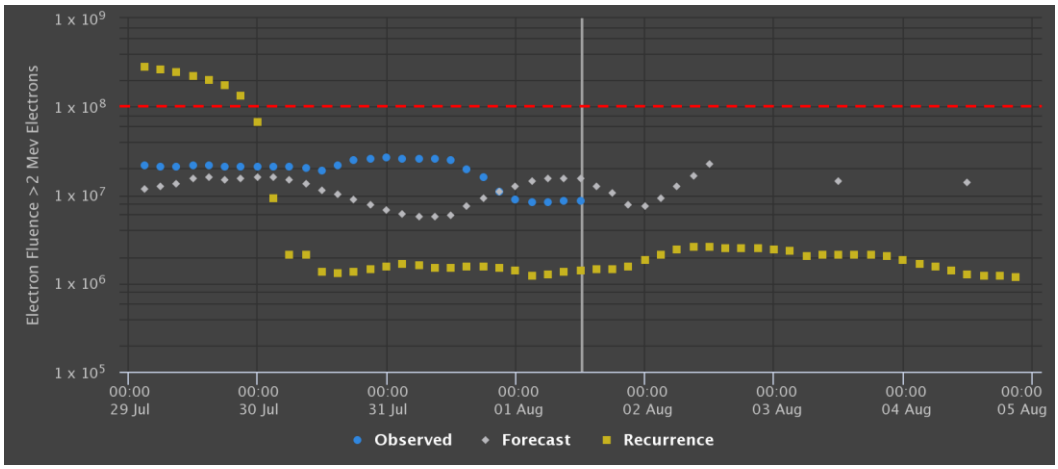
High Energy Electrons Event (≥ 2MeV):

The high energy electron flux (greater than 2 MeV) is initially expected to remain mostly at background to moderate levels, with an increasing chance of breaching the 1000 pfu high threshold during the diurnal maximum. This is due to the charging effects of the HSS from CH07/-.

The 24 hour fluence is most likely to remain below the Active threshold (1e8 integrated pfu) with an increasing trend through the period.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	10	20	30
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 4: MOSWOC REF model



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